



## Local anesthetics (Part III): use in medically complex patients

(This *Clinical Update* is part three of a three-part series.)

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### Purpose

Continual advances in health care and technology mean patients with increasingly complex medical conditions are living longer, more productive lives and are better able to seek dental care in outpatient settings. The practitioner must be prepared to deliver care safely to these patients, taking into consideration the pharmacology of medications used in dentistry.

Local anesthetic use is routine and remarkably safe, but in the medically complex patients two factors must be taken into consideration:(1)

- the presence of disease states that may be affected by the local anesthetic agent, and
- the systemic effects of vasoconstrictors

The purpose of this clinical update is to discuss potential adverse reactions that may result from the use of local anesthetics in medically complex patients and provide recommendations to minimize the occurrence of these untoward events.

### Cardiovascular disease

#### Hypertension

Although vasoconstrictors may precipitate significant elevations in blood pressure, numerous studies have shown that the use of one to two cartridges of 2% lidocaine with 1:100,000 epinephrine (0.018 to 0.036 mg of epinephrine) is of little significance in most patients with hypertension (2). By improving the level of anesthesia, vasoconstrictors lower the risk of endogenous catecholamine release that may result from inadequate pain control (3). For patients with advanced disease, however, special precautions are required. Elective dental care should be avoided in the following situations:(4)

- patients with blood pressure greater than or equal to 180/110 (Stage III hypertension)
- patients who have hypertensive symptoms

Hypertensive symptoms include occipital headache, failing vision, ringing in the ears, dizziness, weakness, and tingling of the hands and feet (2). If emergency dental treatment is necessary, medical consultation is required and vasoconstrictor amounts should be limited to one to two cartridges of 1:100,000 solution (0.018 to 0.036 mg of epinephrine) (1). In patients with blood pressure of 160-179/100-109 (Stage II hypertension), epinephrine should be limited to three cartridges (0.054 mg) (4). The use of retraction cord with epinephrine and intraligamentary and intrabony injections should be avoided in these patients (2).

#### Ischemic heart disease (*Angina pectoris* & *Myocardial infarction*)

Ischemic heart disease results from oxygen deprivation to the heart because of reduced blood supply to a portion of the myocardium. Its causes include atherosclerosis, embolism, coronary artery spasm and congenital abnormalities. Management of these patients involves the use of nitrate drugs, beta-adrenergic blockers, calcium channel blockers, platelet aggregation inhibitors, thrombolytic drugs, and revascularization procedures (coronary angioplasty, coronary stents, or coronary artery bypass graft (CABG) (2).

In the presence of ischemic heart disease, elective dental treatment is contraindicated in the following situations:(1)

- patients with unstable angina
- recent myocardial infarction (less than six months)
- recent CABG surgery (less than three months)

If emergency dental treatment is necessary, medical consultation is required and treatment should be aimed mainly at eliminating pain. Epinephrine dosages should be limited to one to two cartridges of 1:100,000 solution (0.018 to 0.036 mg of epinephrine) (1). Similarly, in patients with stable angina, vasoconstrictors should be limited to one to two cartridges (1).

#### Cerebrovascular accident

Cerebrovascular accident, or stroke, results from the sudden interruption of oxygen flow to the brain and results in focal necrosis of brain tissue. It may occur secondary to thrombosis, embolism or intracranial hemorrhage. Events associated with a stroke range from a transient ischemic attack (TIA), which is caused by a temporary disturbance in brain perfusion and results in reversible neurological deficit, to a completed stroke, which is characterized by permanent neural and motor deficits (e.g., hemiplegia and language disorders). A history of stroke or TIA places a patient at an increased risk for a recurrent episode, especially in the months immediately following a stroke. Deferral of elective dental treatment is advised in the following situations:(2)

- stroke episode less than six months ago
- ongoing TIA episodes

If emergency dental treatment is necessary, consultation with the patient's physician is mandatory. Six months after the stroke, doses of epinephrine should be limited to less than 0.036 mg (1).

#### Cardiac arrhythmia

Disturbances in the normal rhythm of the heartbeat can result from cardiovascular diseases, pulmonary disorders, abnormalities in the autonomic nervous system, systemic diseases, drug-related reactions, or electrolyte imbalances (2). Symptoms can include palpitations, dizziness, syncope, chest pain and difficulty breathing. Medical consultation is required for patients with an existing arrhythmia or conditions that predispose to an arrhythmia. Vasoconstrictors are contraindicated in the following:(1)

- patients with severe arrhythmias
- patients with an arrhythmia refractory to treatment

In addition, intraligamentary or intraosseous injections should be avoided in these patients (2).

#### Congestive heart failure

Congestive heart failure (CHF) is the result of the heart's inability to function effectively as a pump. It is the end-stage manifestation of numerous cardiovascular diseases: systemic and pulmonary hypertension, coronary, valvular and congenital heart diseases, cardiomyopathy, infective endocarditis, and endocrine disorders (2). Signs and symptoms include rapid, shallow breathing followed by periods of apnea (Cheyne-Stokes respirations), heart murmur, arrhythmia, jaundice, fever, cough, distended neck veins, edema, ascites, cyanosis, weight gain, and clubbing of fingers (2). Elective dental treatment is contraindicated in patients with uncontrolled or untreated CHF, characterized by a marked limitation in physical activities and by the presence of symptoms while at rest (1,2). Routine dental treatment is acceptable for patients with well-controlled CHF, although vasoconstrictor dosages should be limited to amounts contained in two cartridges of anesthetic (0.036 mg of epinephrine) (1).

Some medications prescribed for the management of CHF have potential interactions with vasoconstrictors. Digoxin, prescribed to increase the heart's contractile force, has a narrow therapeutic index and may precipitate a cardiac arrhythmia when used concurrently with vasoconstrictors. In patients taking nitroglycerin and other vasodilators, the diminished effects of vasoconstrictors can shorten the anesthetic's duration of action (2). Medical consultation and monitoring of vital signs are necessary in the dental treatment of these patients.

### **Pulmonary disease**

#### *Asthma*

Asthma results from the airway's increased reactivity to various stimuli. Sodium metabisulfite, used as a preservative in anesthetics with vasoconstrictors, is a known allergen that can precipitate an asthma attack. However, studies have shown that allergic reactions to sulfite-containing anesthetics are uncommon among sulfite-sensitive patients. It is estimated that less than four percent of asthmatics are sensitive to sulfites, and that these patients generally have more severe, persistent asthma and require corticosteroid management (1).

Local anesthetics with vasoconstrictors can be used safely in patients with mild asthma. Because of the potential risk of a hypersensitivity reaction to sulfites, however, local anesthetics with vasoconstrictors should be avoided in patients with severe, persistent, corticosteroid-dependent asthma (1).

#### *Chronic obstructive pulmonary disease*

The two most common diseases classified as chronic obstructive pulmonary disease (COPD) are chronic bronchitis and emphysema. The etiologies of these disorders are different, although both result in chronic irreversible obstruction of airflow from the lungs (2).

These patients have a decreased respiratory capacity, and special precautions are required to prevent aggravation of symptoms. There are no contraindications to the use of local anesthetics with vasoconstrictors, however these patients often have co-existing cardiovascular diseases which may require dosage modification (1). Mandibular and palatal anesthetic blocks, as well placement of the rubber dam, may create a sensation of airway constriction and should be avoided as much as possible in these patients (2).

### **Renal disease and hepatic disease**

Lidocaine and other amide anesthetics undergo metabolism in the liver and are excreted by the kidneys (5). The presence of renal disease can lead to inadequate clearance of local anesthetics. Although the routine use of local anesthetics is not contraindicated in patients with renal disease, the dosages must be kept to a minimum and the interval between injections should be extended. Similarly, routine use of local anesthetics is acceptable in patients with mild hepatic disease, but dosages should be reduced and injection intervals increased in patients with more advanced hepatic disease (e.g., cirrhosis) (1). Medical consultation is recommended prior to the dental treatment of these patients.

### **Diabetes mellitus**

The action of vasoconstrictors directly opposes that of insulin. Epinephrine increases gluconeogenesis and glycogen breakdown in the liver, leading to hyperglycemia. An increased hyperglycemic response to epinephrine has been observed in insulin-dependent diabetics. This risk varies, but the diabetic's level of blood glucose control is an important determining factor. As a result, well-controlled diabetics better tolerate vasoconstrictors and have fewer episodes of hyperglycemia than poorly controlled diabetics. Studies have shown that the amounts of epinephrine contained in one to three cartridges of local anesthetic (0.018 to 0.054 mg) may be enough to significantly increase the risk of a complications (ketoacidosis, hyperglycemia) in patients with unstable diabetes, and so should be avoided until their condition is brought under glycemic control

(6). Patients with well-controlled diabetes, on the other hand, can generally receive vasoconstrictor-containing anesthetics without special precautions.

### **Thyroid disease**

#### *Hyperthyroidism*

Hyperthyroidism is characterized by an increased metabolic rate and this is reflected in a constellation of symptoms that commonly include weight loss, exophthalmos and goiter. Hyperthyroid patients frequently have hypertension, cardiac arrhythmias, palpitations, and chest pain. Thyrotoxicosis (delirium, coma, hyperthermia, severe arrhythmia and hypotension) is a life-threatening condition and represents the most severe complication (6,7). The well-managed or euthyroid patient is at low risk for the hemodynamic effects of exogenous epinephrine and so normal concentrations of vasoconstrictors may be administered (1). Untreated hyperthyroid patients must be approached by the dentist with extreme caution. Although the existing data remain equivocal, it is recommended that the use of vasoconstrictors in local anesthetics be avoided in untreated or poorly-controlled hyperthyroid patients (1,6).

#### *Hypothyroidism*

The decrease in metabolic rate secondary to insufficient thyroid hormone production may result in an exaggerated response to the depressant effects of local anesthetics. Additionally, in the poorly-controlled hypothyroid patient, the stress of a dental procedure may result in myxedema coma (hypothermia, bradycardia, severe hypotension and seizures). Patients with mild symptoms of hypothyroidism are at low risk for untoward reactions when receiving dental treatment. Dosages of local anesthetics, however, should be kept to a minimum. In patients with severe or untreated hypothyroidism, elective dental treatment should be deferred until their condition is medically controlled (1).

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